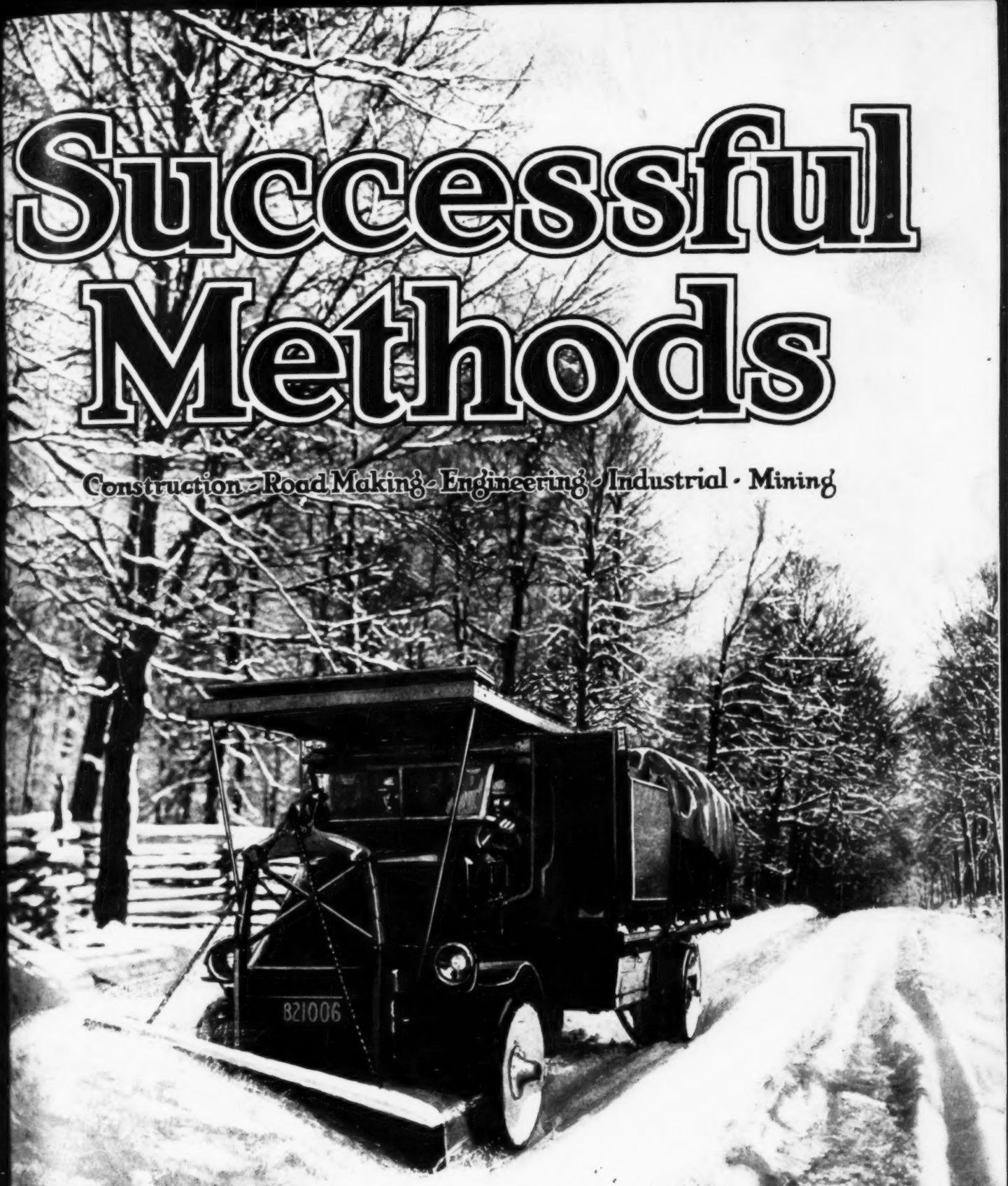
Successful Methods

Construction - Road Making - Engineering - Industrial - Mining



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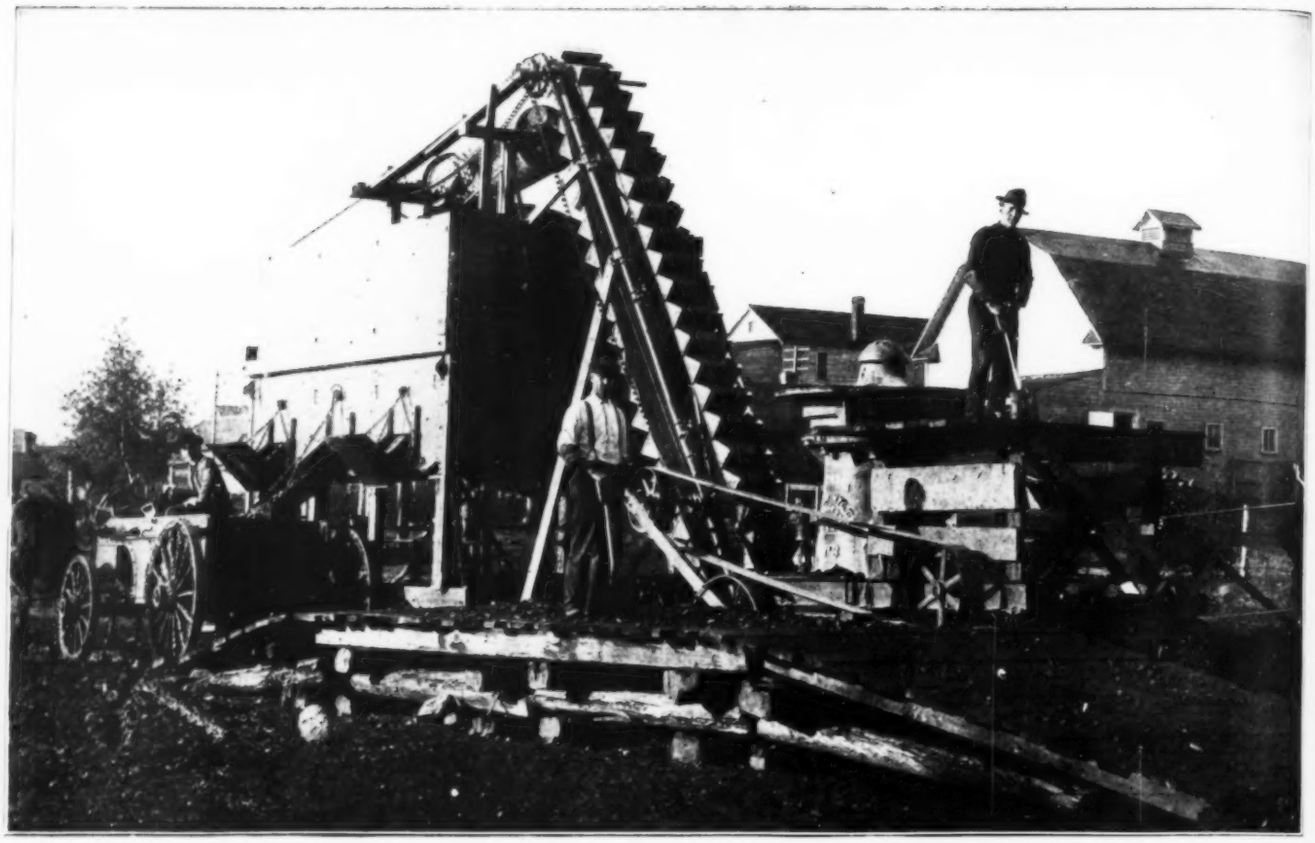

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Successful Methods

A Magazine of Construction Service

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World's Champion Road Builders

ON another page is an announcement of the results of the contest to determine the road building crews which made the best records in 1921. With entries from 27 states and with all the best-known "record-breakers" in the running, the winners deserve the title of their outfit next season, "World's Champion Road Builders."

It may be that some other unheralded crew has made a better record than any submitted for the contest. It also may be that some white hope can lick Dempsey and make a million dollars. Neither has shown up, so the championship title stands in both cases.

The records made by the winners of the first three places are really remarkable. They show what good management, good equipment and real crews of real men can do. But next season—oh, boy, just wait! What some bunch will do to these records will be like "Babe" Ruth's slam at the home-run record last summer. Come on, boys, get set for the 1922 championship!

One Labor Trouble Solution

TUGBOAT men in the Duluth harbor decided a while ago that they were so necessary that they could put over an unreasonable demand for higher pay. But the shipowners have shown them that even tugboat men are not indispensable.

When the men struck, a new navigating order went out: Captains must bring their ships into the harbor and alongside without tugs.

Now it is no small trick to take a 600-ft. freighter through the narrow Duluth harbor entrance in a high wind. It is more of a job to warp one under its own power into the narrow harbor slips and alongside a pier. Lake captains, however, are a courageous lot, worthy of their calling. They have done at Duluth what was thought almost impossible.

Not every unreasonable labor wage demand can be met in this way. On construction jobs in cities, and especially in the building trades, contractors have not dared risk a complete change of methods. But on nearly every job more labor-saving plant can be used. Too many construction men fail to recognize how much trouble they could avoid by the more extensive use of such plant.

Changes of methods that involve more plants and fewer men rarely ever cause any trouble. It will therefore pay to keep in mind that a change of methods may help now and then.

Cutting Overhead

EVER since the bottom dropped out in 1921, managers of business everywhere have been reducing expenses. Competition has forced construction men to go as far in this direction as was necessary in any other class of business. In fact, many construction organizations had to cut to the bone to keep going at all. Through all this period of forced economy, OVERHEAD — in capital letters—has been one big item hard to reduce. On many jobs carried over from last season to next, overhead also is going to take all the velvet.

Looking backward it is easy to see, too, how most of these jobs could have been finished. The trouble was — shortage of material for a few weeks, bad weather, old plant that went to the bad, or some cheap machine that went wrong.

Now next season is looming up. This is the time to take to heart the lessons of 1921 and of the years that went before. Plan ahead on your material schedule. Provide ample plant and wake up to the fact that low-priced plant is rarely ever cheap. Make your schedule to allow for contingencies. If you have a one-season job, buck up and finish it. Then overhead will not take what you should have for profit.

A Material Shortage

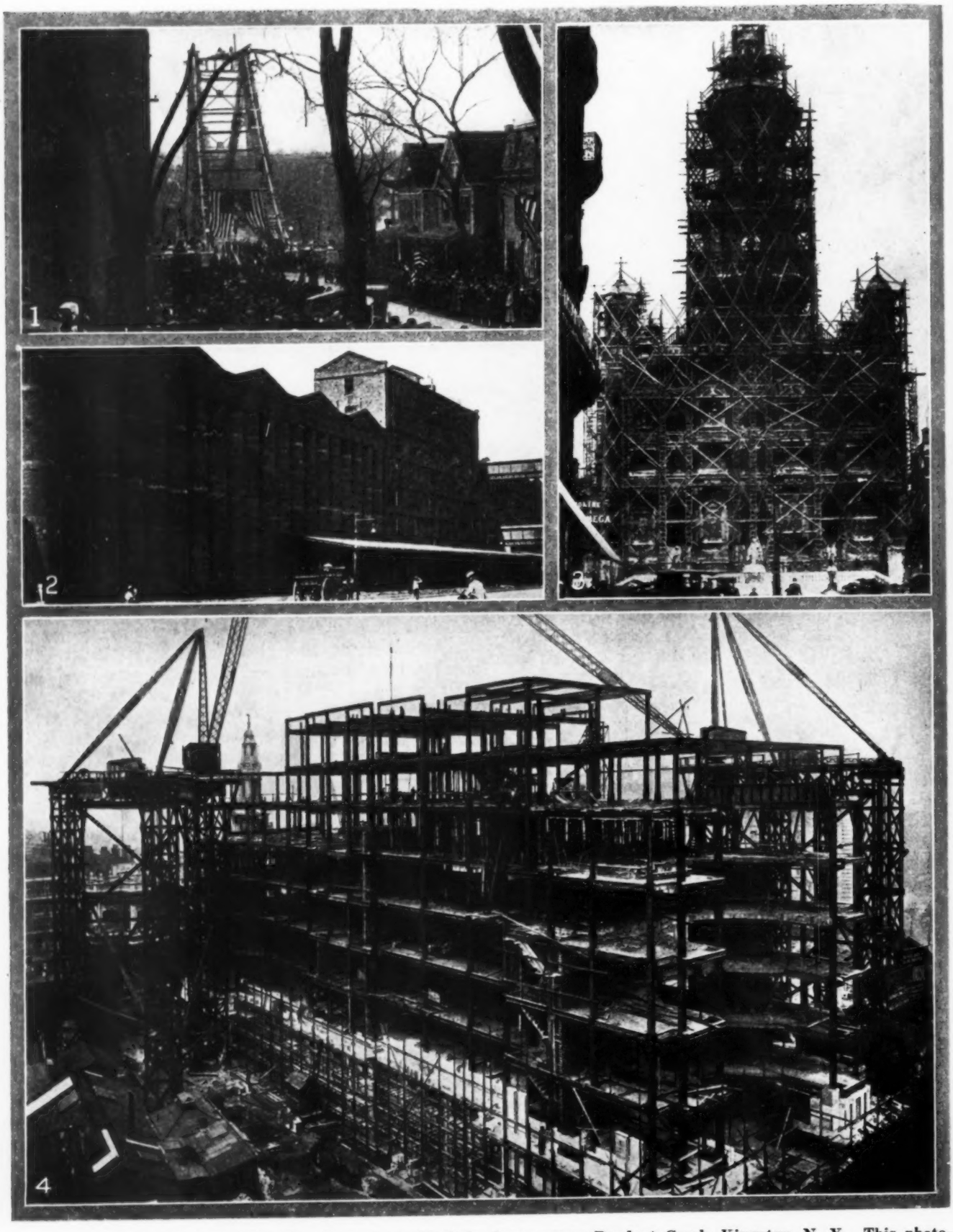
THIS sounds like a war-time idea. It certainly does not appear to fit into present conditions. Maybe not, but here are some facts to ponder over.

In several states the amount of hard-surfaced roads built in 1921 apparently will be determined largely by the local supply of sand, gravel and broken stone. In at least one state there will probably be a serious shortage of these materials.

The cement industry ran practically to capacity last September and October. No new cement mills are being built. The 1922 road program is set far to outstrip any previous year. Building operations this year certainly will exceed last.

Think it over. Have you made sure of your material supply for the coming season?

Construction Stands High



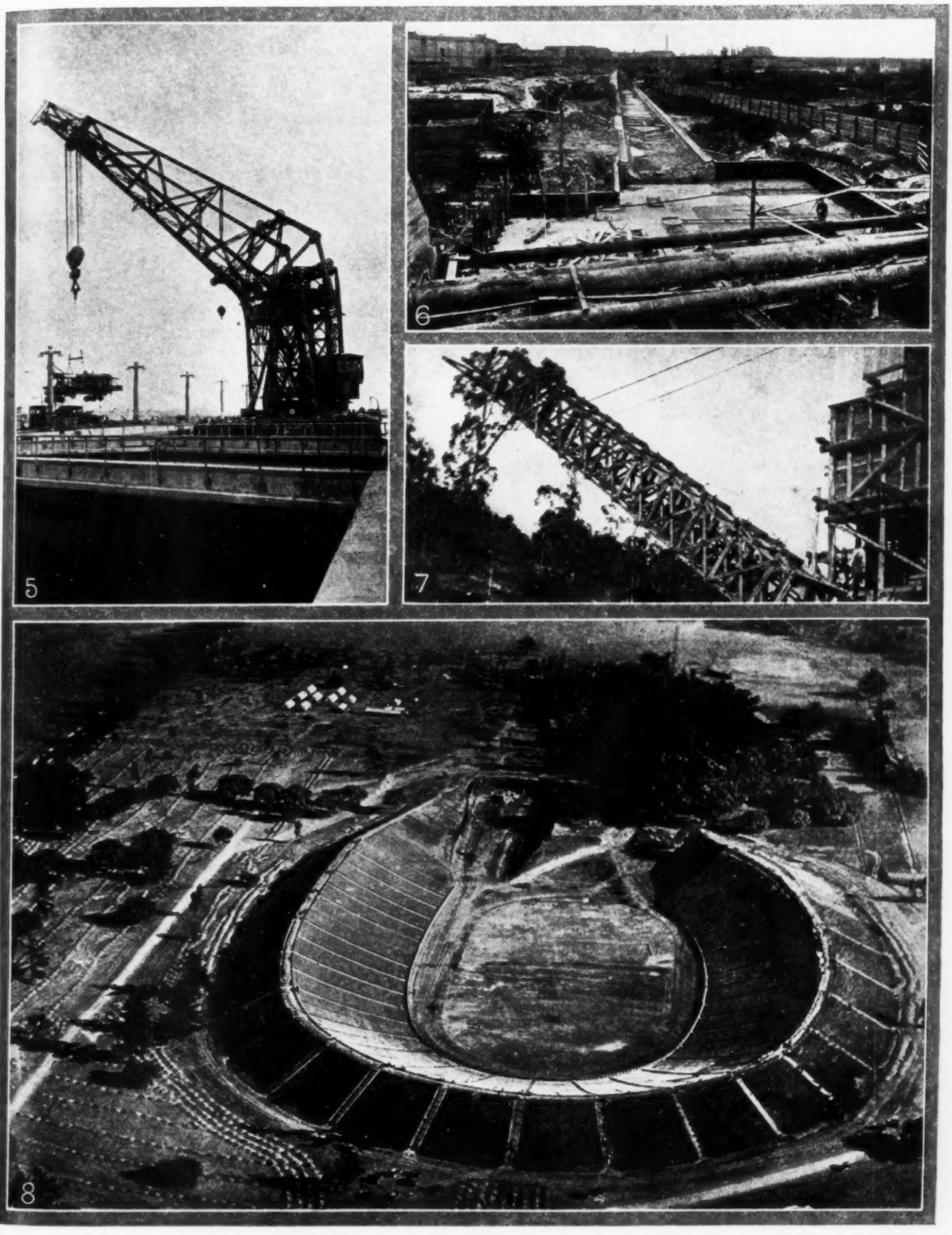
1—A suspension bridge takes the place of an old chain ferry across Rondout Creek, Kingston, N. Y. This photograph shows the official opening by Governor Miller. © *Underwood & Underwood.*

2—This great elevator was built in Buenos Aires to handle the output of the Argentine grain producers. © *Keystone Views.*

3—Repairing the Church of the Trinity in Paris with the aid of a rather elaborate and intricate arrangement of scaffolding. © *Keystone Views.*

4—Good progress is being made on the $10,000,000 Bush Building in London which is being financed by American capital. © *Keystone Views.*

Among World Industries



5—A giant crane at the Panama Canal helps in construction work by lifting bodily a steam shovel that would be called big if the crane were not so much bigger. © *Keystone Views.*

6—The Germans are going ahead with construction work. This view shows one of the operations in the widening of the River Spree in order to increase the port facilities of Berlin. © *Keystone Views.*

7—Erecting a wooden concrete chuting tower on the Maboondah Dam, Healesville, Victoria, Australia. American machinery is used on this work by Edward Carroll, the contractor.

8—An airplane view of the new stadium built at Stanford University in California. It was constructed in less than four months. © *Keystone Views.*

The Prize Winners in Successful Methods World Championship in Concrete Road Building

In order to determine the world champion concrete road builder, the data sent to SUCCESSFUL METHODS by contractors in all sections of the country had to be reduced to certain common denominators. Therefore, all records were reduced to terms of cubic yards of concrete laid in a ten-hour working day, with one minute as the time of mix for each batch. The variances in width and thickness of the roads built by the contractors who entered the contest made it necessary to adopt the cubic yard of concrete laid as the standard; the fact that in many states the length of the working day is restricted by statute made it advisable to reduce all records to a ten-hour standard; and, as most states require a one-minute mix, that unit also was adopted.

The three standards mentioned were the only ones which proved to be reducible to common denominators. Of course, there are many other factors which affect the success of a road job, such as size of mixer, lineal feet of forms to be set and number of square yards of subgrade to be prepared per cubic yard of concrete laid; but it was deemed inadvisable to take them into consideration. After all, the champion road builder is the man who builds the most roads. What the public wants are finished roads, and the man who does the most toward satisfying that desire will be acclaimed as champion, just as "Babe" Ruth is acclaimed as the champion maker of home runs. The fact that "Babe" has a bigger arm and stronger muscles than some other ball player who fails to make as many home runs does not cause the public to prefer the smaller fellow. Results are what count, and "Babe" Ruth produced them. Results are what count in road building, and the man who produces them is the champion, no matter what size mixer he uses.

WILLIAM D. UHLER, Chief Engineer,
Pennsylvania State Highway Department;
JOHN N. MACKALL, Chairman,
Maryland State Roads Commission.

The entries received by SUCCESSFUL METHODS have been reduced to the common denominators set forth above, and under these and the other conditions which were made a part of the original offer, the prize winners, with their records, are:

		1 Day		5 Days		20 Days		Total
		Cu.Yd.	Pts.	Cu.Yd.	Pts.	Cu.Yd.	Pts.	Pts.
1st	G. P. Scharl, Muskegon, Mich.	512.2	20.00	2,263.1	30.00	8,341.4	50.0	100.00
2d	McCree, Moos & Co., St. Paul, Minn.	510.0	17.86	2,168.0	28.86	7,752.0	46.6	93.32
3d	Harry J. Kaiser, Oakland, Cal.	419.7	14.68	1,909.3	25.29	6,813.0	44.5	84.47

As announced in the October and November issues of SUCCESSFUL METHODS, the winner of the championship receives $200, one-third of which goes to Mr. Scharl, one-third to the foreman and one-third to the members of the crew.

As winner of second place McCree, Moos & Company receives $125 to be divided in the same manner.

The third prize winner, Harry J. Kaiser, receives $75 to be similarly divided.

Descriptions of the first two prize winning jobs, with photographs, appear on the next three pages. Unfortunately, Mr. Kaiser, because of the remoteness of his work in Northern California, was unable to send data and photographs in time for this issue of SUCCESSFUL METHODS. A description of his job will be printed next month.

MICHIGAN CONTRACTOR IS WORLD CHAMPION

G. P. Scharl of Muskegon Leads in Contest for Concrete Road Building Title

THE winner of the championship, G. P. Scharl of Muskegon, Mich., gained his title, as may be seen by the table on the preceding page by leading all of the contestants in all three divisions into which the contest was divided. He made the best record for one day, the best record for five consecutive days and the best record for twenty days in one month. This was accomplished on a 14-mile stretch of 18-ft. concrete pavement laid on a road running from the city limits of Muskegon, Mich., to the eastward. It was designated as Michigan Federal Aid Project No. 43.

The road is a through highway carrying much traffic and had been originally improved with gravel to a depth of 10 or 12 in. The entire road is without a curve and practically flat, there being no grades of over 1 per cent with the exception of the last five or six hundred feet.

G. P. SCHARL, THE WORLD CHAMPION CONCRETE ROAD BUILDER

The old road was first ripped up with a scarifier grader pulled by a tractor, the same operation breaking up the old road bed and moving considerable dirt from the center to the sides of the road. The balance of the rough grading was done with teams and board scrapers, some dirt being moved with wheel scrapers. No attempt was made to form ditches during the rough grading, this being left until after the concrete was poured.

The rough grade was

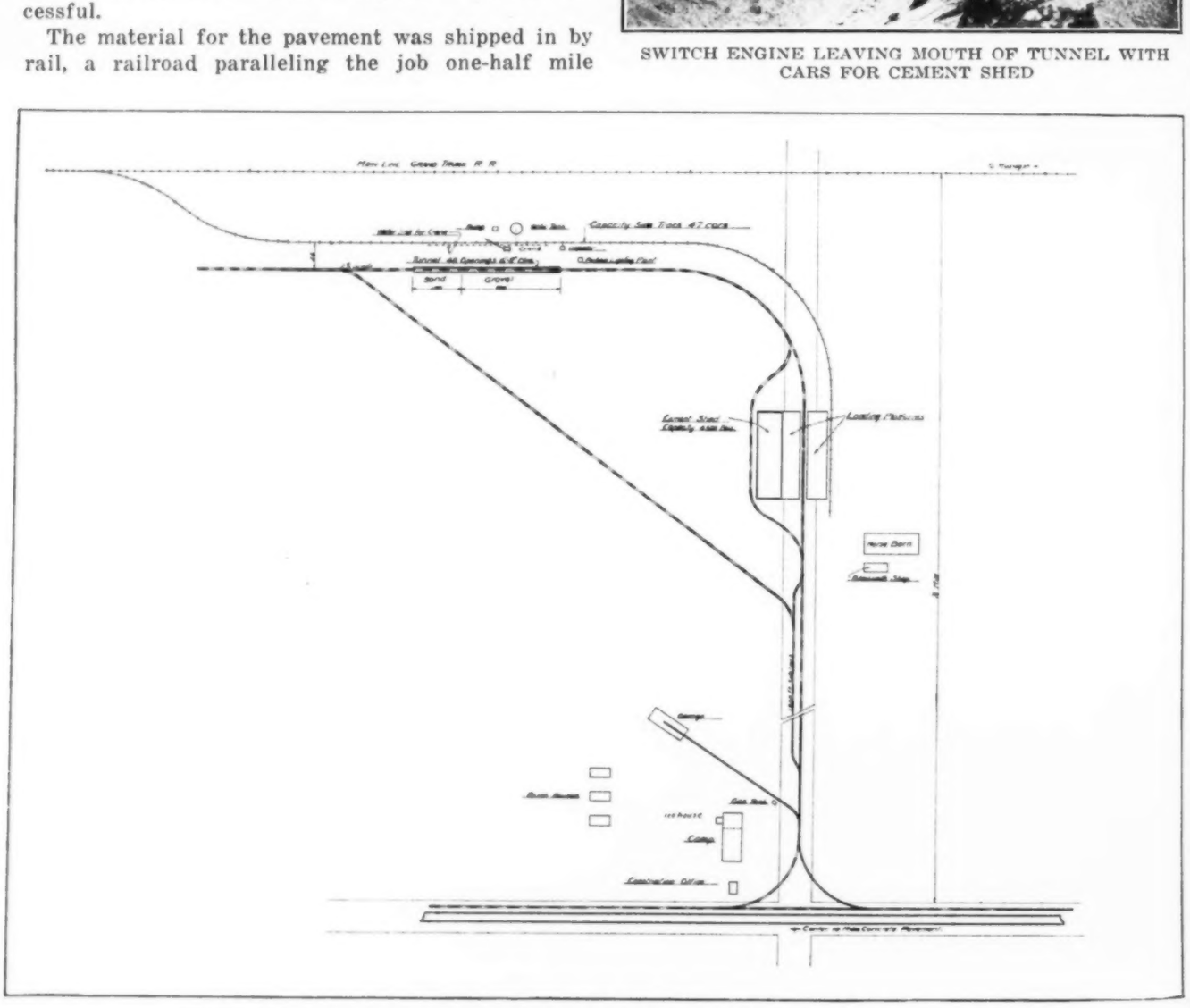
THE PLANT WHICH LAID AND FINISHED THE CONCRETE,—CONSISTING OF CRANE, A SPECIAL 10-BAG MIXER, TWO FINISHING MACHINES AND INDUSTRIAL HAULAGE

FINE GRADER OR ROAD PLANER DESIGNED AND BUILT BY G. P. SCHARL

left slightly high. Steel forms were laid to finish the grade and securely staked. An engineer with an instrument was on the job at all times and worked with the form setters so that no time was lost from lack of stakes. The fine grading was done by a road planer which rode on the forms and was pulled by one team. This road planer was designed and built by the contractor in his own shop and it proved successful.

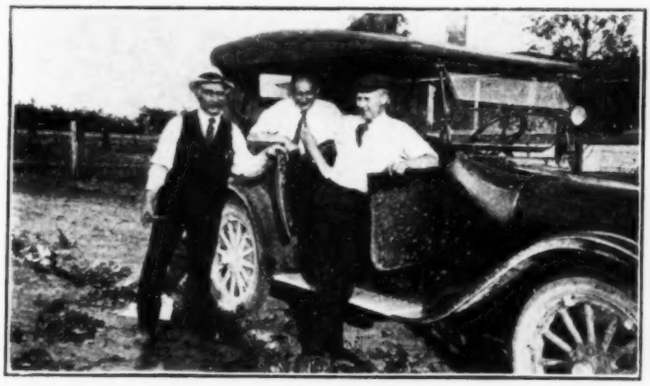
The material for the pavement was shipped in by rail, a railroad paralleling the job one-half mile south. At the center of the job, or seven miles from the city, the material yard and camp were set up. A side track with a capacity of 47 cars first was constructed. Parallel with and near the main line end of this side track and 55 ft. distant, a timber tunnel 300 ft. long was constructed with the top flush with the ground. In the tunnel ceiling were 48 openings with chutes. The sand gravel was unloaded from the cars and placed over the tunnel by a crane. At the far end of the side track a cement shed, with a capacity of 4500 barrels, was constructed. Industrial railroad was used to carry materials from the yard

SWITCH ENGINE LEAVING MOUTH OF TUNNEL WITH CARS FOR CEMENT SHED



THIS PLAN SHOWS THE EFFICIENT LAYOUT OF G. P. SCHARL'S MATERIAL PLANT

to the mixer. Track was laid through the tunnel and parallel to the standard gage siding and between the cement shed and siding. Two cement platforms were built, one between the shed and the industrial track and the other between the industrial track and siding. In this way the cement, which was shipped in sacks, could be loaded from the shed or direct from the cars. Behind the cement shed was a passing track, and between the shed and road was a storage track 1200 ft. long. From the storage track a return track ran to the far end of the tunnel.



LANCE HANLEY, THE RESIDENT ENGINEER, IS THE MAN WITH THE CAP IN THIS PHOTOGRAPH. JOHN CASTENHOLZ, CHAIRMAN OF THE COUNTY ROAD COMMISSIONERS, IS THE MAN WITH THE STRAW HAT AND PIPE. THE THIRD MEMBER OF THE PARTY IS C. F. BOEHLER, LANDSCAPE ENGINEER OF THE MICHIGAN HIGHWAY DEPARTMENT

Two hundred and fifty industrial cars were equipped with wooden, bottom dump batch boxes. Built into each box was a bottom dump steel compartment for cement, each fitted with a steel cover. These cement compartments were placed so as to divide the sand from the gravel. Each compartment held just the required amount of material. Two locomotives were used in the yard and four hauled from the yard to the mixer. The empty cars were taken in trains of ten from the storage track to the tunnel and were filled from the chutes with the sand and gravel, each box holding 30 cu. ft. of gravel and 15 cu. ft. of sand. A heavier type of locomotive pulled the train to the cement shed, pushing the cars which had been loaded with cement ahead to the storage track and placing the train being pulled at the cement platform. The engine then backed around on the passing track behind the cement shed to the tunnel, renewing the operation. At the cement platform the steel compartment of each box was loaded with 10 sacks of cement, making the batch complete. The cement compartments were built water tight, allowing batches to be made up and stored, so that no time was lost at the mixer, waiting for material.

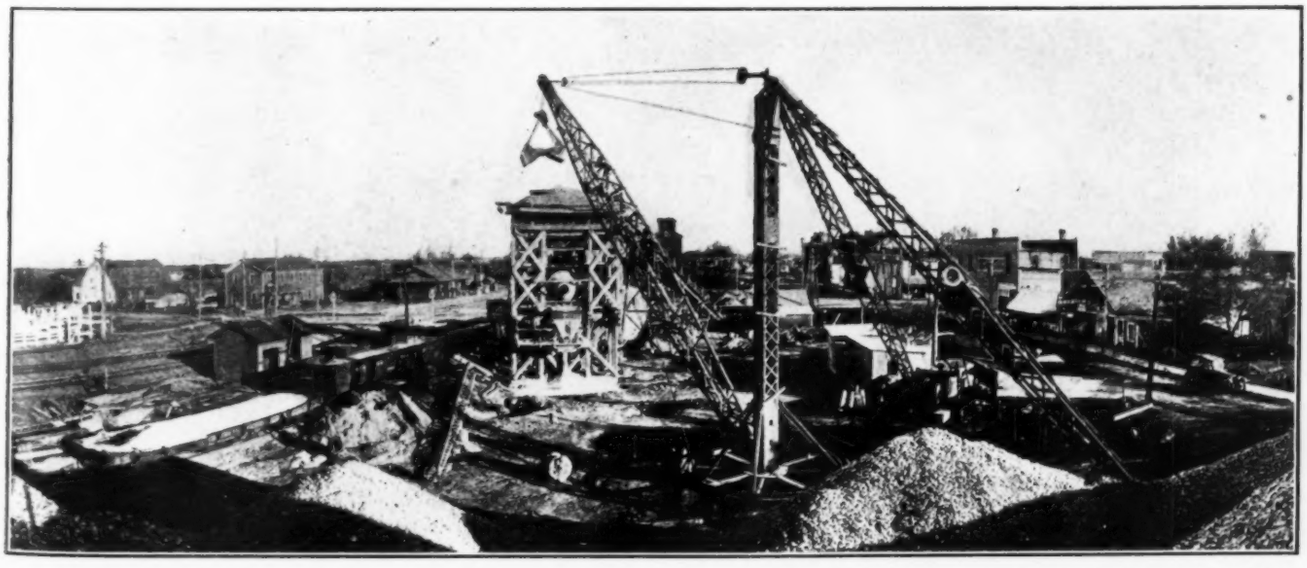
The mixer was a special one handling batches which produced 38 cu. ft. of mixed concrete or the equivalent of three and fifty-three hundredths lineal feet of 18 ft. pavement. This amount of material made it necessary to use two finishing machines, one machine doing the spreading and tamping and the other the finishing.

Water was pumped for the job from streams and was carried in two pipe lines. One line supplied the mixer and the other furnished the water for sprinkling and other purposes.

The job was constructed under the supervision of the State Highway Department, with Lance C. Hanley, County Engineer, in direct charge, and C. E. Foster, District Engineer.

MINNESOTA MEN FINISH SECOND

THE winners of second place, McCree, Moos & Co. of St. Paul, Minn., worked with a central mixing plant with a 1-yd. mixer handling a 6-bag batch. The work was done on the Jefferson Highway, their best records being made on Project 3-21 in Sherburne County. This was an 18-ft. road 7½ in. thick.



A VIEW OF THE EFFICIENT MATERIAL HANDLING PLANT WHICH ENABLED McCREE, MOOS & CO. TO WIN SECOND PLACE

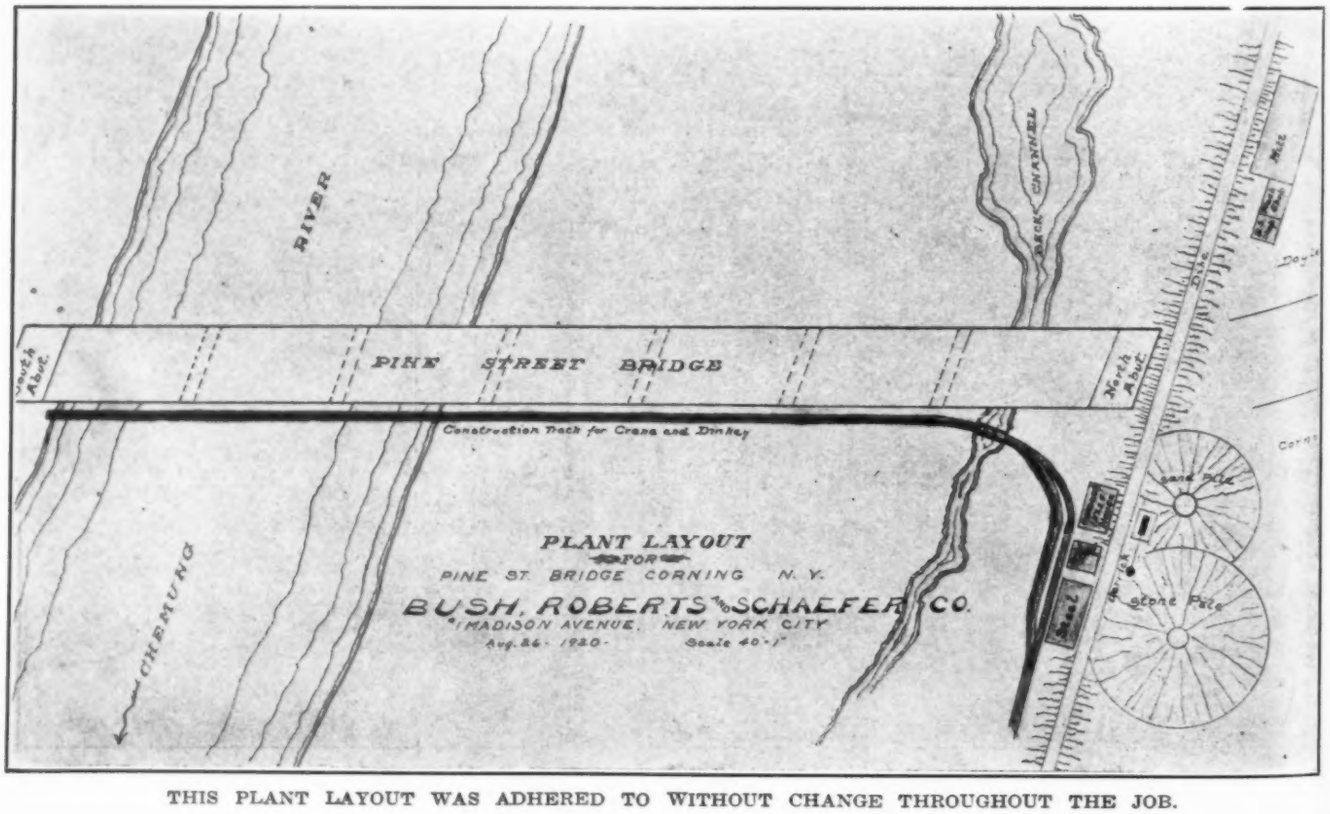
BRIDGE BUILDERS FIGHT FLOODS

Simple Centralized Plant, with Standard and Narrow Gage Track Laid on River Bed, Solves High Water Problem

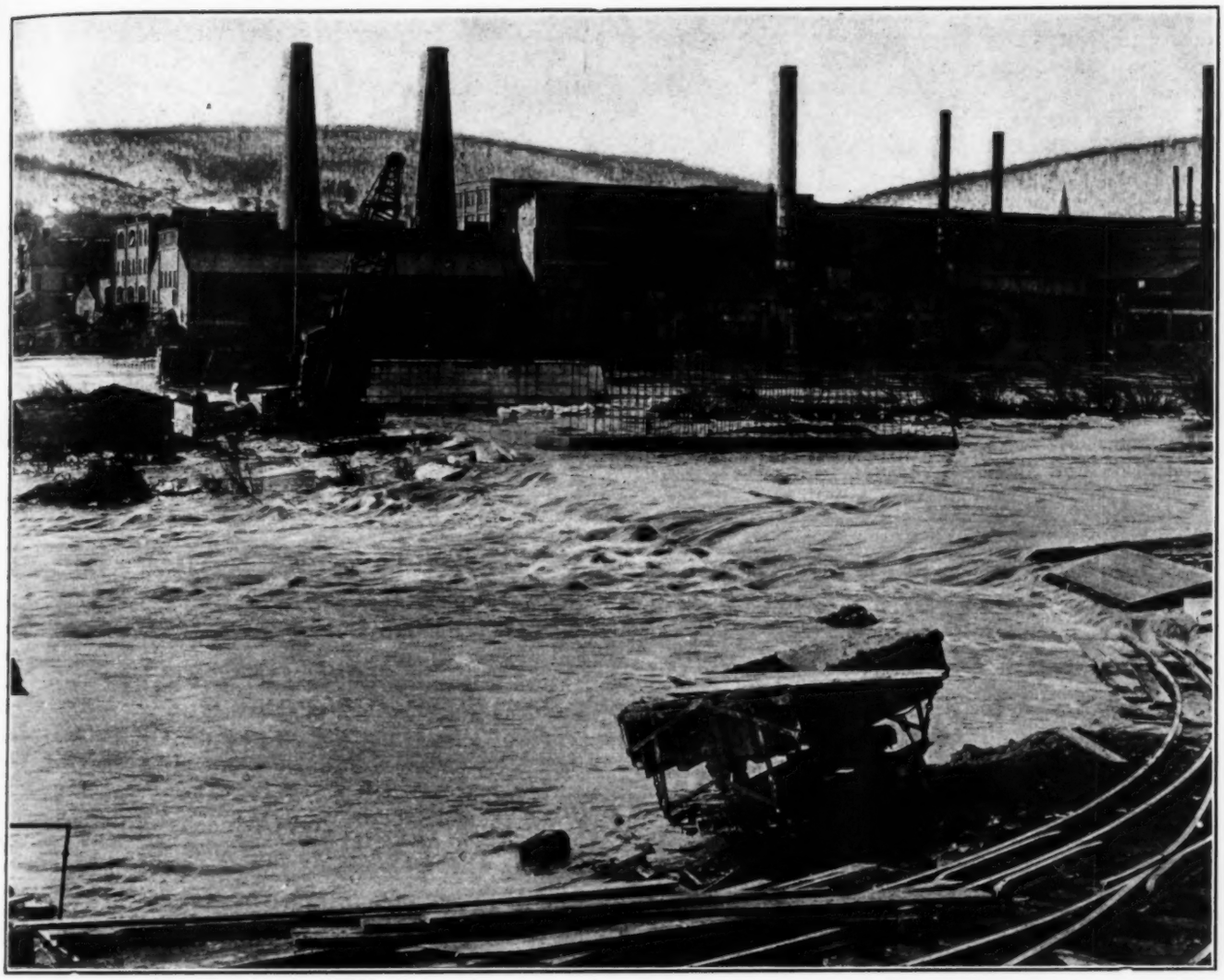
BUILDING a reinforced concrete bridge across a river that has the reputation of raising 19 ft. in as many hours and completing the job a month ahead of schedule is the achievement of the Bush, Roberts & Schaefer Company of New York and Chicago on the reinforced concrete structure known as the Pine Street Bridge over the Chemung River recently completed at Corning, N. Y. The bridge consists of seven concrete arch spans, each approximately 100 ft. long, and having an overall length of 752 ft. The contract was awarded Aug. 20, 1920, and the job completed Oct. 15, 1921—25 days ahead of the date allowed for completion of the contract. Frequency and volume of floods was one of the most important factors influencing the design as well as the construction methods used. As a matter of fact, four freshets actually occurred in the river from November, 1920, to May, 1921, with a rise of water from 8 ft. to 10 ft. at the rate of 1 ft. per hour.

SETTING LAST OF STEEL CENTERS FOR RIVER SPAN.

As both banks of the river are protected by earth dikes, the overall length of the structure was determined by the distance between dikes, and the abutments set into them in such a manner as not to endanger the levees at any time. The center line of piers makes an angle of 70 deg. with the roadway to conform to the flow of the current. The spans are composed of three centered segmental barrel arches, 92-ft. 3-in. span



THIS PLANT LAYOUT WAS ADHERED TO WITHOUT CHANGE THROUGHOUT THE JOB.



A FLOOD SCENE WHICH SHOWS HOW WISE THE CONTRACTORS WERE IN LAYING THE TRACKS ON THE RIVER BED. THE ORDINARY TEMPORARY TRESTLE WOULD HAVE HAD A HARD TIME AGAINST THE ICE AND CURRENT

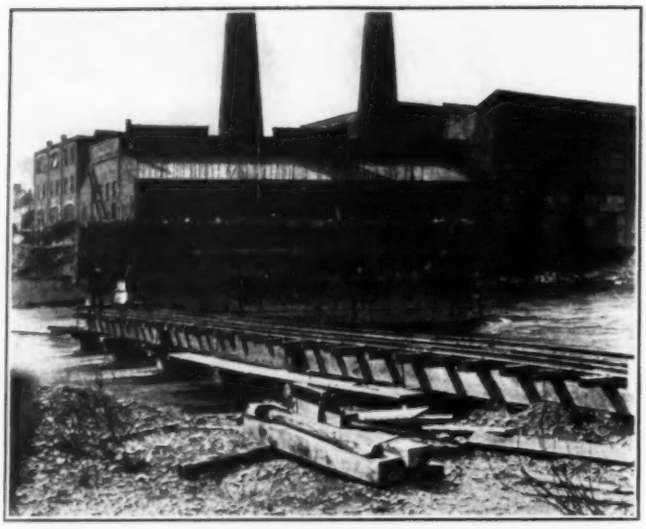
and 11-ft. 3-in. rise. The arches are 41 ft. in width, face to face of parapet walls, and support a 36-ft. roadway on an earth back fill, and two sidewalks 6 ft. in the clear which cantilever 5 ft. beyond the face of parapet walls. The piles, piers, arches and parapet walls, as well as the balustrade and lighting pylons, were all cast in place.

Inasmuch as the contract was signed late in August, the contractor was forced to use all means possible to get the foundations in before the flood period (November to June). To do this a standard-gage track for crane and a narrow-gage track for gas locomotive and narrow-gage cars were laid from the south bank in the river bed on a cribbing of cross ties, the river containing at that time some 24 in. of water. By means of this track a locomotive crane operating a clamshell bucket did the excavating for the abutments and piers. Immediately after the excavation was completed, pile-driving equipment was lowered into the pits and concrete piles were poured. On account of the time element it was decided to use a cast-in-place concrete pile, as no time for curing was required before driving was commenced. Reinforcing rods were worked down into the pile immediately after it was poured and projected 3 ft. 6 in. out of the pile for the purpose of bonding with footing course. In 42 working days 633 piles, or an average of 15 piles per day, were put down.

For all concrete operations the concrete was mixed at the central plant and hauled out over the trestle by means of a gasoline locomotive hauling buckets mounted on small cars. The buckets were swung into place and dumped by means of a locomotive crane. One of the illustrations shows the structural steel centering, one unit of which forms a half width of the arch barrel composed of two ribs made up of four separate Pratt trusses with parallel top and bottom chords. The trusses were assembled on the platform laid out on the ground within reach of the construction track on which the intradosal curve was described. The sections were made to conform with the approximate curve of the arch by wedge-shaped diaphragms at the crown and quarter points of the truss. The true curve for the lagging was formed by wood block shims of variable height, which raised to the proper level and inclination the 6-in. by 12-in. purlins set parallel with the skew axis of the arch. The exact determination of the height and inclination of the shim blocks was greatly simplified on the platform. Over the purlins 4-in. by 10-in. longitudinal

riders on 3-ft. 3-in. centers were warped to the true curve of the intrados to which 2-in. by 6-in. lagging, laid parallel to the skew axis, was nailed. The weight of one rib assembled was 9.2 tons, which was easily handled by crane (60-ft. boom) to its position on the timber bents resting on the footing of the pier.

One of the operations which the contractor is especially proud of is the handling of the steel ribs. From the time they were received at the railroad siding at Corning, some two miles from the job, 28 days were consumed in hauling, assembling and erecting centers, as well as for concreting 4 half ribs.



GETTING THE NEW TRESTLE READY FOR SETTING THE STEEL CENTERS. NOTE HOW TIES ARE BOLTED TO CAPS ON PRECAST PEDESTALS.

After the greatest danger from floods had passed, the track which was laid on the river bed, having well served its purpose, was placed on pre-cast concrete pedestals. These concrete piers or pedestals were placed directly on the river bed, to which the timber deck was made fast by anchor bolts set in the concrete. The idea of placing the construction track first on the river bed was a good one, as it allowed the contractor to start work at once and to work between floods with no danger of the track being washed away. And when the danger of floods was over the concrete pedestals raised the track up and gave greater stability to the trestle for the work of setting the steel centers and concreting the arch barrel. Later the concrete pedestals were used to rip-rap the south abutment.

To circumvent the high freight rates and the car shortage, the contractor, by prospecting in the vicinity, located a satisfactory deposit of sand and gravel which was trucked to the site at a considerable saving.

The bridge contains 6098 cu. yd. of concrete and 140 tons of reinforced steel. Foundation excavation involved the removal of 2311 cu. yd. of material. Bush, Roberts & Schaefer Company of New York and Chicago were the general contractors with J. E. Jones, superintendent. The construction piles were driven under separate contract by the MacArthur Concrete Pile & Foundation Company.

CONVENTION SEASON IS ON

THE convention season of the construction industry is now in full swing. Several conventions already have been held and there are more to follow in the next few weeks. These conventions are well worth the time and money spent in attending them.

The American Association of State Highway Officials held its seventh annual meeting in Omaha on December 5, 6, 7 and 8. All but five or six states were represented at the various sessions at which the progress of road building during 1921 and the plans for 1922 were discussed thoroughly.

Thomas H. MacDonald, Chief of the Bureau of Public Roads, delivered an address in which he outlined the policy of the bureau in regard to the new Federal Aid Act, dwelling especially on the necessity for the maintenance of roads as required by the new law.

Three big national conventions will be held simultaneously during the middle part of January. The American Road Builders' Association will hold the Twelfth Annual Good Roads' Congress and the Thirteenth National Good Roads' Show in the Coliseum, Chicago, on January 17, 18, 19 and 20. The interest in the road show is so great this year that the Coliseum and Annex will not be large enough to hold all the exhibits, and adjoining buildings have been leased to take care of the overflow. Eight sessions of the Good Roads' Congress will be held and a large number of problems in the roadbuilding field will be discussed by representative men.

The Associated General Contractors of America will meet at the Hotel Winton, Cleveland, Ohio, on January 17, 18 and 19. There will be the usual conferences of the different sections of the Associated Contractors, and, in addition, there will be manufacturers' and dealers' exhibits. It is expected that about 1000 contractors will be in attendance at this convention.

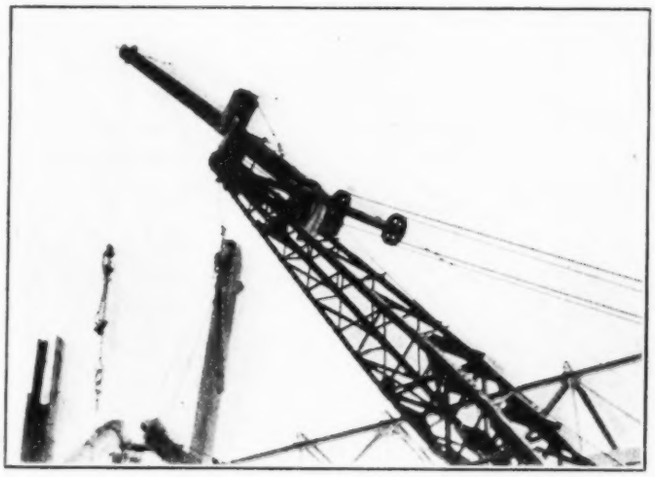
The American Society of Civil Engineers meets in New York on January 18 and 19 and will undoubtedly attract a large attendance of civil engineers from all over the country.

At two recent meetings of contractors the machinery and material men were not only admitted, but were welcome to the sessions. The New England Road Builders' Association held its first annual dinner in Boston on December 15 and made a good beginning by inviting not only its members, but also road builders, material men and supply dealers and their friends. The same plan was adopted by the Associated Pennsylvania Highway Contractors at their second annual meeting and highway conference at Harrisburg on December 15 and 16. At both Boston and Harrisburg the plan of getting together everyone interested in roadbuilding proved successful. The two-day session held by the Pennsylvania contractors made it possible to cover the situation thoroughly.

FAST WORK ON PIER SHED

FAST work on the erection of the 2-story, 70-ft.-by-550-ft. steel shed on Pier 4, South, at the foot of Chestnut Street, Philadelphia, is being done by J. S. Rogers Co., contractors, of Philadelphia, under conditions that are far from ideal. Beginning on November 4, it was necessary to speed up the steel erection so that the interior work could be carried on during severe weather conditions. The manner in which this steel, of which there is approximately 1000 tons, is going up is worthy of note.

Standard-gage track runs the entire length of the center aisle and a locomotive crane equipped with a 50-ft. main boom and a 27-ft. timber extension boom, operating over this track, does the erecting. The main boom is used for the girders and other heavy members, while the extension handles the light beams and roof purlins. As each boom is equipped with a separate hook, as shown in the illustration, a minimum amount of booming is necessary.

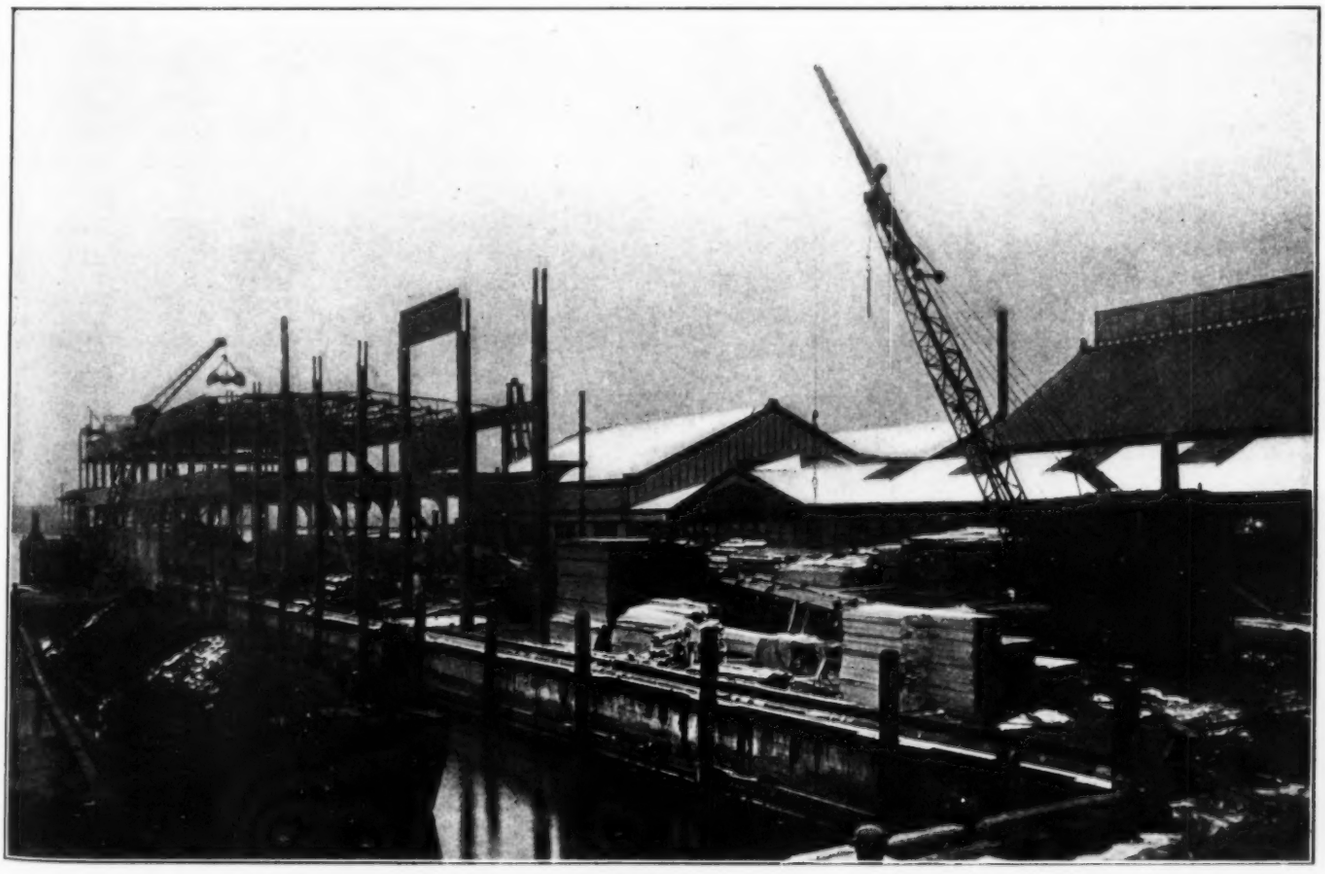


CLOSEUP OF JIB BOOM EXTENSION

The main derrick handles 25 tons and the extension 2 tons. The illustration shows how this extension is secured to the main boom and also how it is trussed for greater strength. The structural steel is received on barges and is unloaded and handled to the crane by means of a stiff leg derrick on the pier. This also is shown in the illustration.

The material for the floors, which are to be of concrete, also is received in barges, and for unloading this material, a locomotive crane is used, which may be seen mounted on a scow and equipped with a gooseneck boom. A clamshell bucket handles the material from the barge through a bay in the roof to a stock pile in the interior of the pier. The shed is 45 ft. high from floor to ridge. The floor slabs are 4 in. reinforced, the first is to be paved with ash blocks.

At the present time 650 tons are erected. Joseph F. Lynch is superintendent and Clarence E. Simpson is in charge of the work.



HOW BOOMS OF SPECIAL DESIGN FACILITATE HANDLING OF SAND AND GRAVEL AND SPEED STEEL ERECTION

RESURFACING CHICAGO'S PRIDE

Michigan Boulevard Gets a New Coat of Asphalt with Crushed Stone Trimmings

ONE of the nation's most famous streets, Michigan Avenue in Chicago, recently was turned over to the road builders or rather to road rebuilders. The wearing surface on the nine-block stretch between Jackson Boulevard and Roosevelt Road was badly worn and the R. F. Conway Company of Chicago was called in to re-lay it. The photographs on this and the next page show the work in progress.

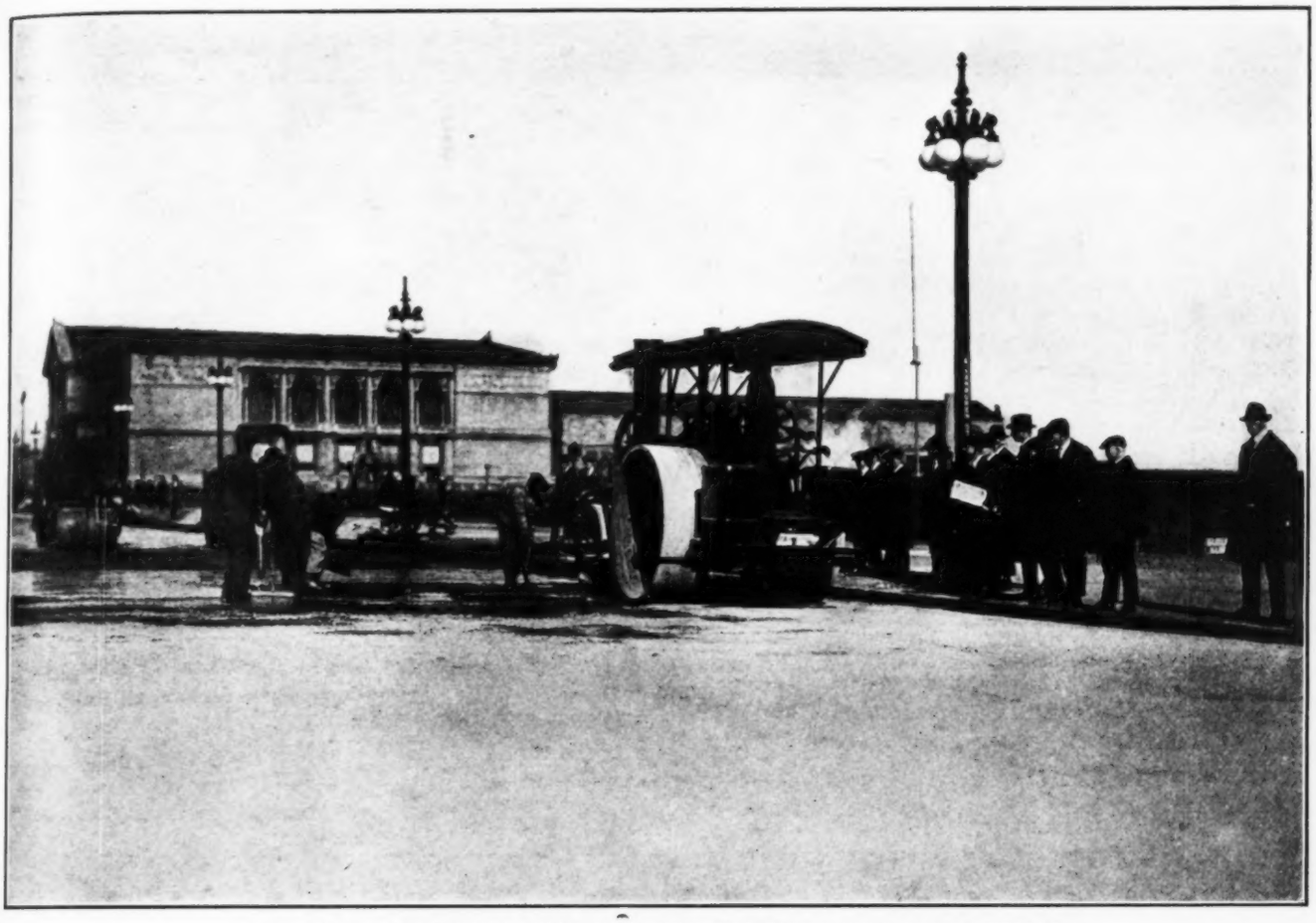
AN OLD-FASHIONED PLOUGH WITH A BACKGROUND OF MODERN TAXICABS.

This work naturally had to be done quickly, and the Conway organization conducted it in such a way that it was possible for the passerby to see all stages of the work in progress at the same time. The old wearing surface consisted of about 3 inches of asphalt laid on a concrete base. A big grading and scarifying machine first was used to rip up this asphalt. It was pulled by a single cylinder motor roller. The ripped up material was loaded into wagons and carted away and new asphalt immediately laid in its place and rolled with a small roller.

As soon as the first rolling was completed hot tar was spread on the asphalt and a squeegee consisting of finely crushed rock was spread evenly on the tar and rolled into the asphalt with a three-wheeled motor roller. In the past, tandem rollers have been used for this work, but on this job it was found that the three-wheeled machine did much better work because of its greater compression. It did not seem to damage the pavement in any way despite the fact that it followed the asphalt very closely.

When this operation was completed the asphalt was

RIPPING UP THE OLD SURFACE OF MICHIGAN AVENUE.



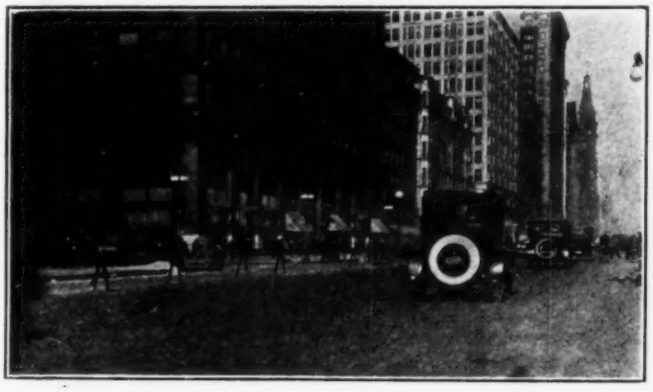
THE FINAL OPERATION—CRUSHING THE SQUEEGEE INTO THE ASPHALT.

WORKMEN SCATTERING THE FINELY CRUSHED STONE.

A SMALL TANDEM ROLLER MAKING A QUICK TURN.

allowed to cool for a few hours and the street was then opened to traffic. Some of the squeegee is gradually loosened and works its way to the gutters, but enough of it is left imbedded in the asphalt to strengthen the wearing surface to a considerable extent.

The speed with which the job was completed



was a notable feature and was exceeded only by the interest with which the "Boul Mich" crowds watched the road makers at their task. The photograph at the bottom of this page shows the finished job after the reconstruction crew had departed and traffic was in full tide on the famous street.

CONCRETING DURING A SNOW-STORM

Work on University Test Pavement Carried on in Freezing Weather by Successful Method of Heating Materials

AN experimental road built by the Pennsylvania State Highway Department, in conjunction with the United States Bureau of Public Roads and the Engineering Department of the University of Pennsylvania, was recently completed at Hamilton Walk on the grounds of the University in Philadelphia. The road consists of 7 sections 18 ft. square, each section containing a different type and weight of reinforcing. In the illustration is shown the reinforcing ready to be placed in one of the sections. In the early part of the next year tests will be commenced to determine the action of the various types of reinforcing; the stresses in the concrete and steel. The road is being constructed under the State Highway specifications and has the dimensions of 6: 8: 6. A 1-2-3 mix is used and the batches are mixed 1¼ minutes. The University of Pennsylvania, which has a short course in highway engineering beginning in February, will start the tests.

While in the process of pouring the road, a snow of several inches accompanied by falling temperatures occurred. As there was no stop on account of these conditions, the method of heating materials used and considered absolutely safe is of interest. Six inches of salt hay was first placed on the finished slab. Four 2-in. steam lines were then placed on the hay. Then another layer of hay which was, in turn, covered with tarpaulins. The same 4 lines heated the sand and stone. Materials were heated to a temperature of about 55 degrees. Water was heated from the mixer boiler. While this method of protecting from cold weather is naturally expensive, the Highway Department feels that it is perfectly safe to be used where it is necessary and desirable to finish up a small section of road work under freezing conditions.

The subject of concreting or of finishing up a piece of concrete road work under possible freezing conditions is rather a sore point and is often the bone of contention between the contractors and various highway departments. Some states pursue the policy of arbitrarily closing down concrete road jobs on November 1. The State Highway Department of Pennsylvania, which probably handles the greatest amount of concrete road building of any State, has no set rule in this regard, but allows the conditions

ONE TYPE OF THE REINFORCING THAT IS TO BE TESTED.

to govern the individual cases, which would seem manifestly more fair to all concerned. It would seem to work a hardship on the contractor which would be retroactive on the taxpayers to force him to lay over the season and finish up a small portion of a job the following year.

In the town of Putnam, Conn., Linberg & Street, contractors of Boston, built a stretch of concrete road in the winter of 1918 and 1919. During part of the pouring period the temperature was at the freezing point or below. The materials were heated by means of a kerosene heater which directed a flame into the drum of the mixer. The drum was turned longer than for the usual mix and the concrete was deposited on the road with no special effort exerted to hurry the finishing of the surface. After the surface was finished about 6 in. of salt hay was placed on the new concrete. After a 3-weeks' curing period the road was thrown open to traffic. The only apparent difference was that the concrete did not bleach out as quickly and setting up was slower than it is when concrete is poured under warmer temperatures. From close inspection of this road, covering two years, not a sign of a crack has appeared, and the Division Engineer in charge of the work has stated that it is one of the best pieces of concrete in his division. The same contractors built a road under similar conditions at Rutland, Vt., using the same method as at Putnam with very good success.

PROTECTION FOR SLAB AND SUBGRADE.

STEAM LINES HEAT SAND AND STONE.

INTENSIVE TRAINING FOR SNOW FIGHTERS

THAT all the lessons taught by the recent world war have not been forgotten is proved by the fact that the Department of Street Cleaning of the City of New York is running an intensive training course, the students or candidates for which are recruited from no less efficient an organization than the ash drivers of the city.

Provided that the candidate has the proper mechanical requirements he is given 4 days of intensive training in the handling of snow fighting equipment with which the Department of Street Cleaning of the City of New York expects to tackle the big job of keeping New York streets open during the coming winter which, from all accounts, is to be a hard one.

The city's snow fighting equipment includes tractors and tractor ploughs and an enormous fleet of trucks as well as elevating conveyors. It will be readily seen that to have a big corps of men in reserve who are familiar with this equipment and capable of handling it will be a great asset to the city.

SAVING FUEL IN CONSTRUCTION WORK

THE railroads of the country have recognized the fact for some time that fuel economy is an extremely important factor of their operating expenses and they have given, and will continue to give, it their utmost attention. They have standing committees composed of various operating officials and others who are constantly on the alert to devise ways and means of lessening the consumption of fuel. Without going into the many details regarding the proper care of all equipment in order to bring about this saving, the following suggestions are offered as reminders of what to look out for in the matter of fuel conservation.

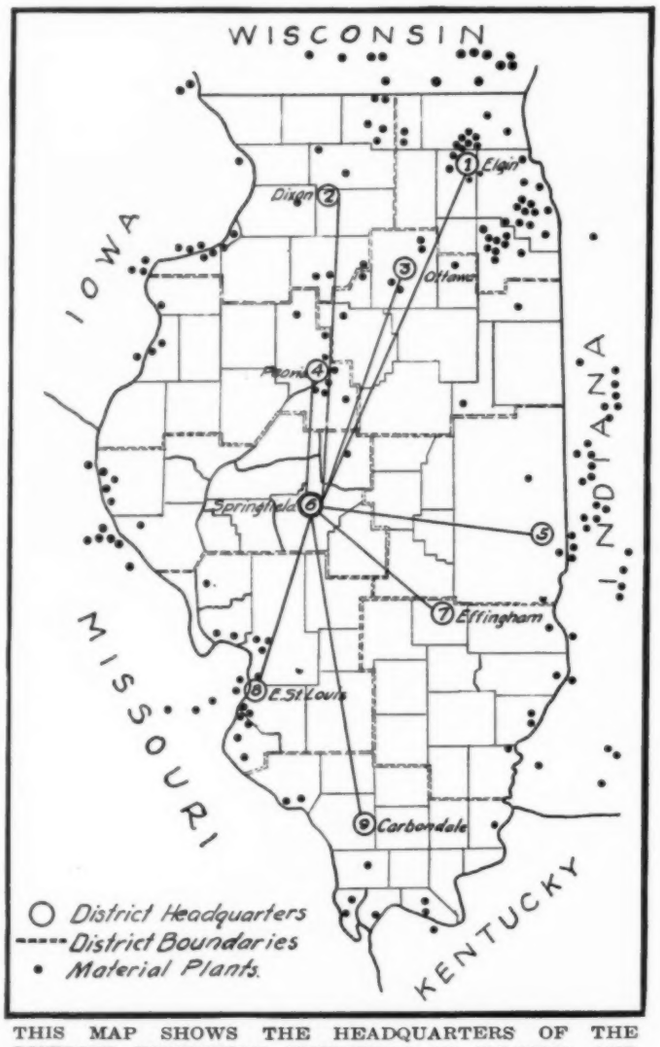
In the first place, accounts should be kept of the coal burned even in your smallest steam producing units to see that none is wasted. Obviously coal is wasted when steam is wasted. Stop all steam leaks. Keep the boilers clean. Get the best water possible for boiler use. There is no use trying to remedy troublesome water with boiler compounds unless such compounds are made for the water in question. The way to find out what is needed is to have a chemical analysis made and a suitable compound prepared.

A big saving in fuel can be made by heating the water before it enters the boiler with exhaust steam from the engine. For every 11 deg. that the feed water is heated there is a saving of 1 per cent of fuel. The selection of the boiler is important, as with easy firing, moderate draft and ordinary fuel a boiler develops one-third more commercial horsepower than is required by the work in hand.

ILLINOIS INSPECTS HIGHWAY MATERIALS AT THE SOURCE

By H. F. Clemmer, Testing Engineer, Division of Highways, State of Illinois

FIELD inspection of highway materials in Illinois on a large scale began in 1919, when construction was started in this State on interstate roads, such as the Lincoln, Dixie, Chicago, Milwaukee, National Old Trails and Chicago-St. Louis Highways. Previous to this time the testing of road oils, asphalts, paints, creosoted wood blocks, bricks, steel and cement was accomplished by a small but efficient staff of engineers at the Highway Testing Laboratory in Springfield. The advent of construction such as the building of interstate highways necessitated a system which would facilitate the testing of thousands of cubic yards of materials in the field. To meet this need inspectors were placed over different sections of the highways under construction to travel back and forth inspecting the material as it arrived, and make reports each day to the Highway Testing Laboratory in Springfield. Cement was inspected at the seven mills supplying it by junior testing engineers, who made their tests as soon as the material was loaded and immediately sent the reports of its acceptability to the resident engineers. During the year 1919, 299,329 yards of sand, gravel and crushed stone and 751,489 barrels of cement were inspected with exceptionally good results.



THIS MAP SHOWS THE HEADQUARTERS OF THE DISTRICT INSPECTION ENGINEERS IN ILLINOIS AND THE MATERIAL PLANTS OVER WHICH THEY HAVE SUPERVISION.

In 1920 a decided change in the method of inspecting aggregate was adopted. Inspectors, instead of being placed at construction sites, were located at the source of production. This system permitted the installation of inspection equipment of a more permanent nature, insuring in some degree better facilities for making a more thorough inspection. Perhaps the greatest advantage in adopting the "production site inspection" lies in the fact that rejection of unsuitable material at construction points is eliminated and, consequently, a saving in time and expense is experienced by the materials man, the contractor and the State.

Under the new system, materials from 69 plants in this and neighboring states were inspected. Over 690,000 cubic yards of sand, gravel and crushed stone passed the tests made by the inspectors. During this year inspection was carried on at nine cement plants, 1,281,537 barrels of the product being tested.

At the beginning of the 1921 construction season an improvement was made on the already satisfactory system of inspection. District testing engineers—men with considerable experience in highway materials—were permanently located at district engineers' headquarters. The duties attached to this office are to supervise the work of the inspectors in the different districts and to co-operate in every respect with the district engineers in their efforts relating to materials. The testing engineers also visit construction sites, confer with the contractors and see that material troubles are cleared up in a quick and efficient manner.

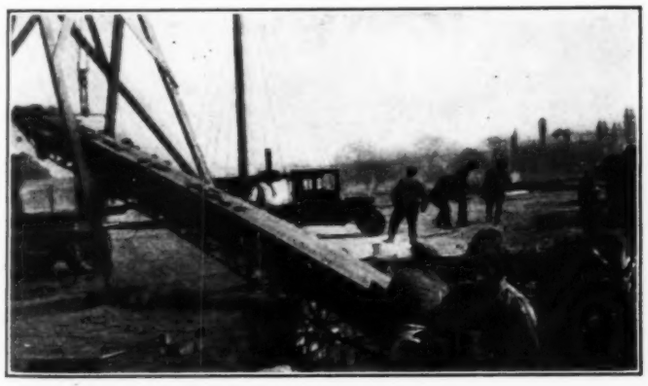
During the first eight months of 1921 over 650,000 cubic yards of aggregates were inspected for use in Illinois highways. This material came from 80 different plants in Illinois and surrounding states.

It would appear that inspection as thorough and on such a large scale as carried on by Illinois could not be economically maintained. A careful accounting of the costs of inspection during 1920 was made and, including the laboratory expense, was found to be a trifle less than .7 of 1 per cent of the construction costs. This year a slight increase is expected, but the most liberal estimate keeps the costs under 1 per cent of the construction expense.

Unloading Brick from Lighters

THE contrast in methods usually in vogue around New York City's waterfront for unloading brick from lighters is shown in the accompanying photographs. The hand method shows a group of seven

men, each picking up seven brick (a hand) at a time and throwing them directly into the truck. When the barge was not over 3 ft. below the pier, the average time of loading the truck by hand was about 16 minutes. With a gang of five men transferring brick to a 39-ft. 18-in. smooth belt conveyor the time of loading varied from 12 to 20 minutes. The conveyor worked at a considerable angle, however, the tide being lower than when the unloading was being done by hand. Ignoring the difference in tide, which materially handicaps the hand labor, the conclusions from this test, which covered a week's time, are—by hand, seven men averaging 16 minutes per truck; by conveyor, five men averaging 16 minutes per truck, saving two men's time per truck.

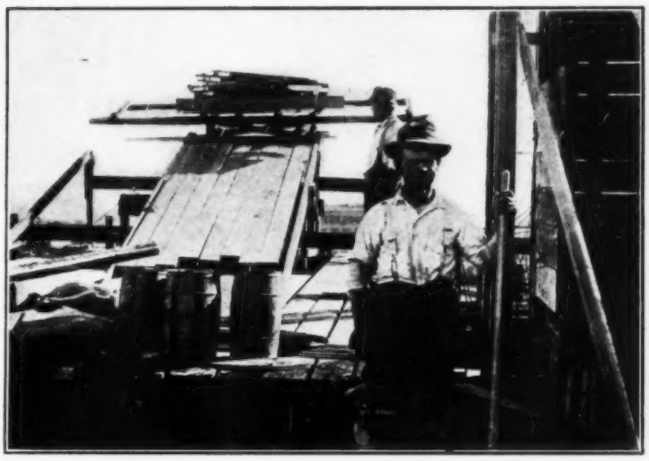


Pile Heads Sawed into Form Lumber

BY-PRODUCTS as a source of revenue to the contractor are generally nil. Occasionally, excavated or other waste material, however, may be turned into profit. The Frederick Snare Corporation, formerly Snare & Triest, is sawing pile butts into form lumber on its Philadelphia pier job. The work, which is the construction of Pier 3, North, Philadelphia, includes the driving of 7195 timber piles. The butts, which, under the terms of the contract, are required to be removed from the river, are placed on skids and are delivered to a saw rig on an adjacent pier. By means of the saw, which is of the traveling carriage type, the butts, varying in length from 5 to 12 ft., are sawed into lumber suitable for forms. One sawyer and two helpers, whose wages aggregate $14 per day, saw about 6000 ft. in 10 hours. The saw is steam driven, steam being furnished from the contractors' central plant.

Elevator Unloads Automatically

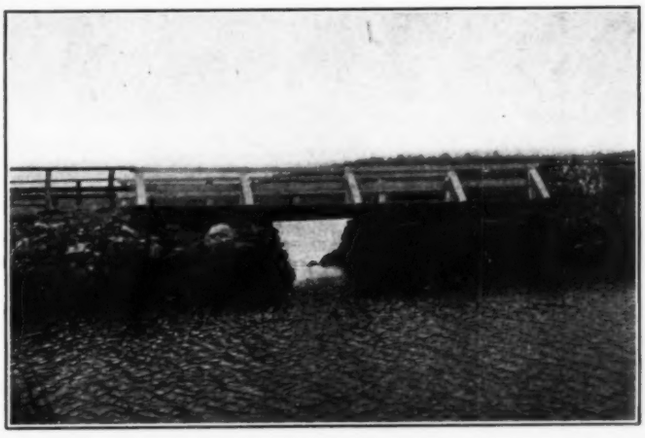
A CONTRACTOR in San Francisco is using an elevator to elevate reinforcing steel and lumber to the top of buildings under construction which unloads automatically when the elevator reaches the top. The



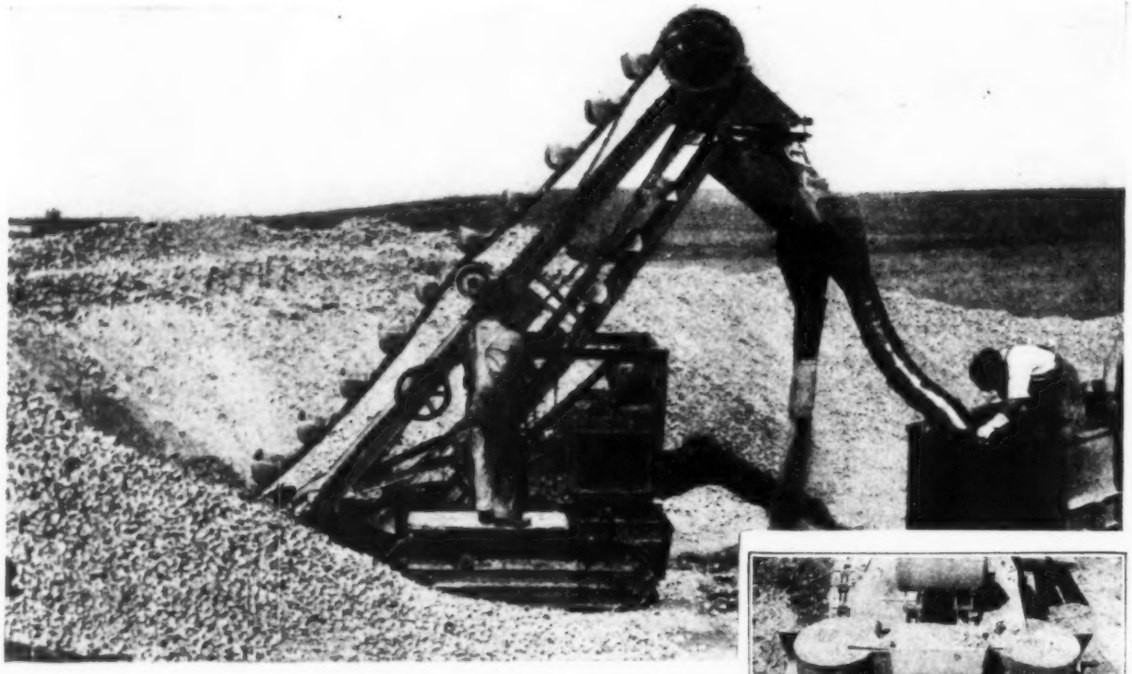
accompanying photo shows how the load is automatically dumped when the elevator reaches the roof, the load sliding down the incline. The elevator carriage is about 30 in. wide by 10 ft. long. The outer edge is slightly raised, as shown in the photograph, to keep the load from falling off as it is raised. A light gasoline single drum builders' hoist is used to operate the elevator.

Inexpensive Bridge Renewals

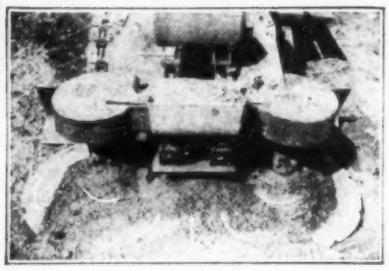
AN inexpensive method of renewing old bulkhead highway bridges is illustrated by the photograph below taken on a road in Connecticut. To avoid excavating for the new abutments, treated timber stringers are used. These stringers are made long enough and rest on sills sufficiently far back from the channel so that when the earth and stone banks take their natural slope they will not be interfered with.



Contractors Claim Barber - Greene



List & Hallett, Kansas City, Mo.



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Rieth-Riley, Goshen, Indiana

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When you buy roadbuilding equipment, you want each machine to operate efficiently on ALL your jobs. With Barber-Greenes you don't have to pick your jobs to fit your equipment They even make it possible to extend the use of much of your present equipment.

The past season has added many new applications to the list of Barber-Greene performances in road building. Contractors tell us that Barber-Greenes fit *practically any job* and prove it with examples of their actual jobs.

If you want to see for yourself, send in the coupon for our new book on "Actual Jobs" compiled from data furnished us by roadbuilders throughout the country. It is filled with illustrations and diagrams. Send for it today.

WHAT THEY SAY:

R. F. Conway Co.,
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"We have been using four of the Barber-Greene Loaders for the past two years in the laying of highways for the State of Illinois. We have found their use up to the present time extremely satisfactory and *have reorganized our entire plan of operation for the handling of materials for concrete work as the result of the experience we have had with the use of your machines."*

C. H. Winans Co.
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"When this machine completed its work at Linden (concrete road job) it was immediately *transported by truck* to Hackettstown, N. J., a distance of *about fifty miles* and set to work in a gravel pit loading gravel for use on another job at that point.

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"I think I am safe in estimating that it would take 20 men to handle the rock our Barber-Greene will."

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"A number of contractors in this vicinity have one or more Barber-Greene Loaders now, and I have yet to hear of a complaint from one of them. *The machine is well built throughout and will stand continuous hard service."*

Brereton & Bauck,
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"We are not working our B-G Loader to capacity for the reason that our industrial haulage outfit has a smaller daily capacity than the Loader. It has handled 42000 yards on this job. *We wish to say that for this particular contract the Barber-Greene has been an ideal machine."*

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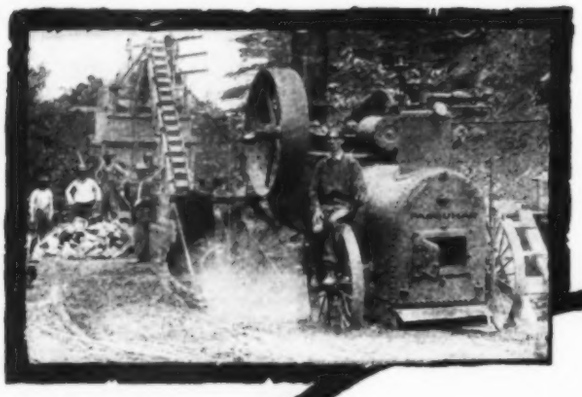
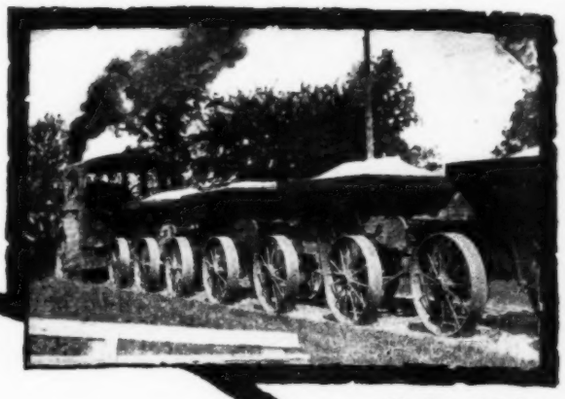


Crusher operated by Style B Locomotive Rig.



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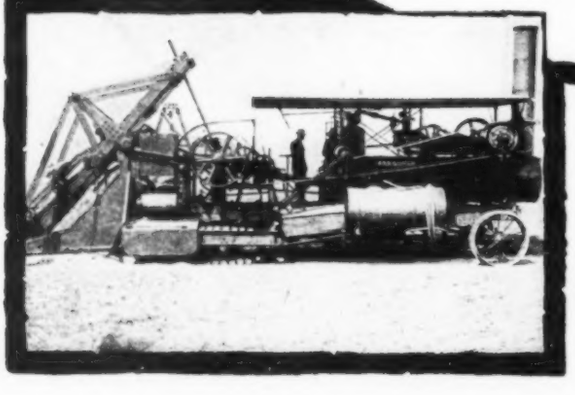

Style K Tractor driving Rock Crushing plant.